Apple Assembly Line

$1.80

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In This Issue...

A New Book Appears

Jim Sather's new book, Understanding the Apple //e, arrived today. We'll have a complete review next month, but at first glance it looks even better than his first book. Check our ad on page 3 for pricing.

And an Old Book Reappears

Roger Wagner Publishing has obtained the rights to Roger's "Assembly Lines -- the Book" from Softalk. A new edition is now available, still at $19.95. We sold hundreds of copies of this book, which in excellent tutorial fashion leads a beginner into the fascinating world of assembly language. "Assembly Lines -- the Disk" is also available, with all the sample source code formatted for the Merlin assembler. If you wish to order the book from us, our price is only $18 plus shipping.

Postage Increases

The recent Post Office rate increases had little effect on the Bulk and First Class rates, only $.015-.03 per piece, or $.18-.36 per year per subscription. We'll accept that much of a cost increase. Foreign Air Mail is another matter, though. Those rates went up by $.16-.19 per piece, or $1.92-2.28 per year per subscription. Therefore, the foreign subscription rate is now $32 per year.

Putting S-C Macro on a QuikLoader Card.........Jan Eugenides

The QuikLoader by Southern California Research Group is one of those rare devices that causes you to wonder how you ever got along without one. I have had mine for about a year now, and I would never go back to the old way of loading programs!

Briefly, the QuikLoader allows you to put whatever programs you desire on EPROMS, which then plug into the QuikLoader. EPROMS from 2716-27512 can be used, for a possible 512K bytes of program space on one QuikLoader (equivalent to four Apple floppies!). You can have more than one card, of course, so there's lots of room available for just about anything. The QuikLoader also comes with DOS 3.3 already installed, along with FID, and COPYA. When you turn on your machine, you'll hear a little whoop instead of the familiar beep. DOS has just been loaded in about 2 seconds. No more booting! In fact, I seldom put DOS on a disk anymore, and I can use the space for programs instead.

Programs which are on the QuikLoader can be loaded into RAM and executed in about 2 seconds, with just two keystrokes! Since they are loaded into their regular RAM locations, they do NOT need to be modified in any way.

You can see a catalog of the QuikLoader by typing "Q" followed by RESET. The program names appear with letters A-Z next to them. Then you can select and run the programs by typing the letter corresponding to that program. Alternatively, if you want to run the primary routine on a chip, just press the number of the socket it is in followed by RESET. More on this later.

Putting programs on the QuikLoader is somewhat problematical, however. The manual is STILL in it's draft form, although they have been promising a better one for over a year. Oh well...a little trial and error is good for the soul.

In order to put the S-C Macro Assembler on the QuikLoader, it is necessary to write what's known as a "primary" routine. The QuikLoader has a built-in operating system which allows you to move blocks of memory to their RAM locations from the various EPROMS on the QuikLoader card, and then execute them however you wish. The following program is intended to be used on a 27128 EPROM, which will hold the entire S-C Macro Assembler, with driver (I used the Ultraterm driver for this program) and the Fast Bload patches, which I chose to load between DOS and its buffers, rather than actually patch the DOS. You can do it either way, it's up to you.

This program is called the "overhead" for the EPROM. It goes at $FEB0 in the actual chip. The catalog must appear at $FF00. These are the addresses as the Apple would see them, not the absolute addresses relative to the chip. A 27128 will address as though it runs from $C000 to $FFFF as far as the Apple is concerned. In other words, the chip's address $0000 equals the Apple's address $C000. Things are further complicated by the fact that an Apple II+ cannot address the range from $C000 to

S-C Macro Assembler Version 2.0	$100
Version 2.0 Upgrade Kit for 1.0/1.1/1.2 owners	$20
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Double Precision Floating Point for Applesoft (with source code)	$50
S-C Documentor (complete commented source code of Applesoft ROMs)	$50
Source Code of //e CX & F8 ROMs on disk	$15

(All source code is formatted for S-C Macro Assembler. Other assemblers require some effort to convert file type and edit directives.)

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$C7FF without a small circuit modification. In this case it's no problem, the space from $C800-$FFFF is more than enough to house the entire assembler. If you needed more space, you could put your primary routine in the $C000-$C7FF space.

The rest of the EPROM contains the code for the assembler itself, and the fast Bload patch. The assembler goes from $C800-$EFFF, and the Bload patch from $F000 to $F04D. You must pack these files together in RAM somewhere prior to burning the chip. In other words, Bload the assembler at, say, $2800-4FFF. Put the Bload patch at $5000-504D Then Bload the overhead program at $5EB0. The rest of the EPROM doesn't matter. Then burn all this stuff into the EPROM starting at $800 relative to the chip. Thus, when you install the chip on the card, it will show up at $C800-FFFF like it should. If your EPROM burner won't burn partial chips, just start the burn from $2000 and it'll work out.

That's it. Just install the chip on the QuikLoader in any socket. To run the assembler just type the socket number followed by RESET. In two seconds the assembler will load and start! No more waiting to boot DOS, load the program, etc. You don't even have to look for a disk! Sure speeds up the work.

This should help augment the information in the manual a little, and get you on your way. I have installed the S-C assembler, Rak-ware's DISASM, a modified SOURCEROR (it now ouputs S-C format code, heh heh), the S-C Word Processor, a terminal program of my own design (it's capture buffer exactly coincides with the S-C Word Processor buffer! I can come off-line and begin editing with two keystrokes, and no disk access!), and some other utilities. All stored inside the Apple, available instantly at any time. For $170 (the price from S-C Software), the QuikLoader is a MUST.

By the way, for a reasonable fee I will install programs on EPROMS for you. You supply the programs and EPROMS, and I'll do the rest. Some programs are not suitable...particularly those which access the disk a lot. They would require extensive modification and that's best left to the original author. Also, copy-protected stuff cannot be loaded, because there's no way to ge at the files. Contact me if you're interested, at 11601 NW 18th St., Pembroke Pines, FL 33026.

[For $20, S-C Software will send registered owners of version 2.0 a 27128 with the S-C Macro Assembler on it. This adds five lines to the QuikLoader menu, allowing you to choose the screen driver you wish. Only the $D000 (language card) version is provided.]

Here's the overhead program, with GETSLOT overhead taken from the QuikLoader manual.

```
                  1000 *SAVES.ASSEM.2.0.OH(FAST BLOAD)
                  1010 *--------------------------------
                  1020 *1/31/85
                  1030 *--------------------------------
                  1040 *
                  1050 *S-C MACRO ASSEMBER OVERHEAD - ULTRATERM VERSION
                  1060 *                 by Jan Eugenides
                  1070 * 3/9/85
                  1080 *
                  1090 *--------------------------------
                  1100 *CHIP 0 ROUTINE EQUATES
                  1110 *--------------------------------
                  1120 *Y-register indexes of the chip 0 routines
                  1130 *--------------------------------
                  1140 *
00-               1150 MOVEBLK    .EQ 0       Move data block to RAM
08-               1160 GOMRBRD    .EQ 8       Go to motherboard
                  1170 *--------------------------------
                  1180 *
                  1190 * GENERAL EQUATES
                  1200 *
                  1210 *--------------------------------
26-               1220 PRISLOT    .EQ $26  Storage for primary slot
2D-               1230 QLMAP      .EQ $2D  bitmap of QL slots
3A-               1240 SRCL       .EQ $3A  indirect source
020A-             1250 SAVCTRL    .EQ $20A save control word
C081-             1260 QLCTRL     .EQ $C081  QL control register
                  1270 *--------------------------------
                  1280 *
                  1290 * GET SLOT EQUATES
                  1300 *
                  1310 *--------------------------------
18-               1320 QLOFF      .EQ $18  00011000 QLOFF; CHIP 0
20-               1330 CHKNUM     .EQ $20  NUMBER OF FIND SLOT CHECKS
40-               1340 GSCL       .EQ $40  GET SLOT C PARAMETER.
41-               1350 GSCH       .EQ $41
42-               1360 GSEL       .EQ $42  GET SLOT E PARM
43-               1370 GSEH       .EQ $43
C006-             1380 SLTXROM    .EQ $C006     IIE SOFT SWITCH
C00A-             1390 INT3ROM    .EQ $C00A         *
C00B-             1400 SLT3ROM    .EQ $C00B         *
CFFF-             1410 CLRROM     .EQ $CFFF
                  1420 *--------------------------------
                  1430          .OR $FEB0
                  1440          .TF ASM.2.0.OH
                  1450 *--------------------------------
                  1460 * This program will start the assembler in 80x32
                  1470 * mode with ultraterm.  Assumes that assembler has
                  1480 * been patched at $DBC9 and $DC11 for 32 line mode.
                  1490 * i.e. the normal $17 is now $1F.  If mode is changed
                  1500 * these bytes must be re-patched. ($2F for 48 line mode)
                  1510 * For S-C assember 2.0 March 1985 version with Bob's
                  1520 * ultraterm driver attached at $F700.
                  1530 *--------------------------------
FEB0- A9 00       1540 START.PROG LDA #0    Turn on Ultraterm
FEB2- 20 00 C3    1550            JSR $C300
FEB5- A9 16       1560            LDA #22   bring up in 80x32 mode
FEB7- 20 ED FD    1570            JSR $FDED
FEBA- A9 B5       1580            LDA #"5   Mode 5
FEBC- 20 ED FD    1590            JSR $FDED
FEBF- A9 CB       1600            LDA #$CB
FEC1- 8D D1 03    1610            STA $3D1  set warmstart vector
FEC4- A9 00       1620            LDA #0
FEC6- 8D 00 9D    1630            STA $9D00 make room between DOS a buffers
FEC9- 20 D4 A7    1640            JSR $A7D4 for fast BLOAD patch
FECC- A9 30       1650            LDA #$30
FECE- 8D A6 AC    1660            STA $ACA6 patch dos to call fast Bload
FED1- A9 9C       1670            LDA #$9C
FED3- 8D A7 AC    1680            STA $ACA7 which is now at $9C30
FED6- A9 4C       1690            LDA #$4C
FED8- 8D 00 E0    1700            STA $E000
FEDB- A9 00       1710            LDA #0
FEDD- 8D 01 E0    1720            STA $E001  put assembler coldstart vector at $E000
FEE0- A9 D0       1730            LDA #$D0
FEE2- 8D 02 E0    1740            STA $E002
FEE5- AD 80 C0    1750            LDA $C080 select ram card
FEE8- 4C 00 D0    1760            JMP $D000 coldstart assembler
                  1770 SP.END
```

```
                *-------------------------------
FEEB-                  .BS $FF00-*   SKIP TO FF00
                *-------------------------------
                *KATALOG ENTRIES START HERE
                *-------------------------------
FF00- 90        ASMK   .DA #$90      PRIMARY
FF01- 9F FF            .DA N.RESET SOURCE
FF03- 00 00            .DA $0000     LENGTH
FF05- 00 00            .DA $0000     DESTINATION
FF07- C1 D3 CD         .AS -"ASM"
                *-------------------------------
FF0A- 86               .DA #$86      END OF KAT RECORD
                *-------------------------------
FF0B- 00 C8     ASMPARM1    .DA $C800       SOURCE  assembler + driver goes here
FF0D- FF 27                 .DA $27FF       LENGTH  will load from $D000-$F7FF
FF0F- 00 D0                 .DA $D000       DESTINATION
FF11- 00 F0     ASMPARM2    .DA $F000       SOURCE  fast bload routine
FF13- 4D 00                 .DA $004D       LENGTH
FF15- 30 9C                 .DA $9C30
                *-------------------------------
FF17- 4A        INVERT      LSR
FF18- 6A                    ROR
FF19- 6A                    ROR
FF1A- 6A                    ROR
FF1B- 29 E0                 AND #$E0
FF1D- 8D 0A 02              STA SAVCTRL
FF20- 60                    RTS
                *-------------------------------
FF21-                  .BS $FF53-*   SKIP TO FF53
FF53- A9 18     OFFLP  LDA #QLOFF
FF55- 9D 81 C0         STA QLCTRL,X         TURN OFF THE QL
FF58- 20 5D FF  RTSLOC JSR GETSLOT          THIS INSTRUCTION AT $FF58 (RTS)
FF5B- D0 F6            BNE OFFLP
                *-------------------------------
                *
                * FIND SLOT NUMBER BY COMPARING CNXX TO ENXX FOR EACH SLOT
                * START WITH SLOT 7   USR MUST BE RESET FOR SEARCH TO BE
                * EFFECTIVE IN II OR IIE.
                *-------------------------------
FF5D- 8D 06 C0  GETSLOT     STA SLTXROM    ENABLE IIE I/O SELECTS
FF60- 8D 0B C0              STA SLT3ROM
FF63- A9 00                 LDA #0
FF65- 85 40                 STA GSCL
FF67- 85 42                 STA GSEL
FF69- A9 C1     TRYAGEN     LDA #$C1       START WITH SLOT 1
FF6B- 85 41                 STA GSCH
FF6D- A9 E1                 LDA #$E1
FF6F- 85 43                 STA GSEH       DESTINATION = $EN00
FF71- A0 20                 LDY #CHKNUM    GET NUMBER OF CHECKS TO VERIFY
FF73- B1 40     LOOKLP      LDA (GSCL),Y
FF75- D1 42                 CMP (GSEL),Y
FF77- D0 19                 BNE NOTHERE    BRANCH IF QL NOT IN THIS SLOT
FF79- 88                    DEY
FF7A- D0 F7                 BNE LOOKLP
FF7C- A5 41                 LDA GSCH
FF7E- A8                    TAY
FF7F- 0A                    ASL            GET SLOTNUM TIMES $10 TO X
FF80- 0A                    ASL
FF81- 0A                    ASL
FF82- 0A                    ASL
FF83- AA                    TAX
FF84- B9 86 FE              LDA $FE86,Y  GET BIT MAP
FF87- 05 2D                 ORA QLMAP
FF89- 85 2D                 STA QLMAP      SET BIT IN QLMAP
FF8B- 8D 0A C0              STA INT3ROM    LEAVE INT3ROM AS NORMAL RESET DOES
                *-------------------------------
                *NORMAL RESET FORCES SLTXROM
                *LEAVE 3ROM AND XROM AS WITH NORMAL RESET
                *-------------------------------
FF8E- AD FF CF         LDA CLRROM   EXPANSION ROM OFF
FF91- 60               RTS
FF92- E6 41     NOTHERE     INC GSCH
FF94- E6 43                 INC GSEH       CHECK IN NEXT SLOT
FF96- D0 DB                 BNE LOOKLP     BRANCH ALWAYS
                *-------------------------------
                *EQU $C0 SHOULDN'T OCCUR; BOMB IF DOES
                *-------------------------------
```

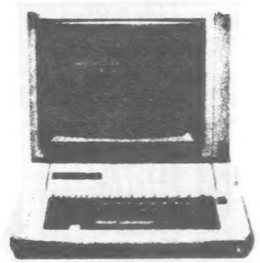
```
FF98- 80       2550 MAP      .DA #$80
FF99- 40       2560          .DA #$40
FF9A- 20       2570          .DA #$20
FF9B- 10       2580          .DA #$10
FF9C- 08       2590          .DA #$08
FF9D- 04       2600          .DA #$04
FF9E- 02       2610          .DA #$02
               2620 *--------------------------------
               2630 * THIS IS N.RESET ROUTINE OF THIS CHIP
               2640 *--------------------------------
FF9F- 20 17 FF 2650 N.RESET      JSR INVERT        Invert the control word
FFA2- A0 05    2660              LDY #5
FFA4- B9 0B FF 2670 .1           LDA ASMPARM1.Y    Move ASSEMBLER parms
FFA7- 99 3A 00 2680              STA SRCL Y
FFAA- 88       2690              DEY
FFAB- 10 F7    2700              BPL .1
FFAD- AD 0A 02 2710              LDA SAVCTRL       get control word
FFB0- A6 26    2720              LDX PRISLOT       slot in X reg
FFB2- A0 00    2730              LDY #MOVEBLK      Command index for move block routine
FFB4- 20 EC FF 2740              JSR GOCHIPO       Call chip 0 to move block
FFB7- A0 05    2750              LDY #5
FFB9- B9 11 FF 2760 .2           LDA ASMPARM2.Y    Move Fast Bload routine parms
FFBC- 99 3A 00 2770              STA SRCL,Y
FFBF- 88       2780              DEY
FFC0- 10 F7    2790              BPL .2
FFC2- AD 0A 02 2800              LDA SAVCTRL       get control word
FFC5- A6 26    2810              LDX PRISLOT       Slot in X reg
FFC7- A0 00    2820              LDY #MOVEBLK      Command index - move block
FFC9- 20 EC FF 2830              JSR GOCHIPO       Call chip 0
FFCC- A0 3B    2840              LDY #SP.END-START.PROG
FFCE- B9 B0 FE 2850 .3           LDA START.PROG,Y Move startup program to $300
FFD1- 99 00 03 2860              STA $300,Y
FFD4- 88       2870              DEY
FFD5- 10 F7    2880              BPL .3
FFD7- A9 02    2890              LDA #$02         put address-1 on stack
FFD9- 48       2900              PHA
FFDA- A9 FF    2910              LDA #$FF
FFDC- 48       2920              PHA
FFDD- A0 08    2930              LDY #GOMRBRD     jmp to $300 to start
FFDF- AD 0A 02 2940              LDA SAVCTRL
FFE2- A6 26    2950              LDX PRISLOT
FFE4- 4C EC FF 2960              JMP GOCHIPO
               2970 *--------------------------------
FFE7-          2980          .BS $FFEC-*    SKIP TO FFEC
FFEC- 9D 81 C0 2990 GOCHIPO      STA QLCTRL,X  GO TO CHIP 0
FFEF- 4C 9F FF 3000              JMP N.RESET   DO N.RESET ROUTINE OF THIS CHIP
FFF2-          3010              .BS 3
FFF5- 60       3020              RTS
FFF6-          3030              .BS 2
FFF8- 00 FF    3040              .DA ASMK      FIRST KATALOG LOCATION
FFFA- FB 03    3050              .DA $3FB      NMI VECTOR
```

New Book: Inside the Apple //c

What Gary Little did for the //e he has repeated for the //c. Of course a lot of the material is the same for both computers and both books, but there is much new material. If you have a //c and not a //e, then this book will be much more helpful.

For one thing, when explaining assembly language he includes the new opcodes and address modes of the 65C02. For another, the chapter on Disk Operating Systems is now 100% ProDOS, and includes more detail on ProDOS than the //e book. Naturally, since the //c has no cassette port or I/O slots, that material has been left out. On the other hand there is a lot of new data about the Apple mouse port and the built-in serial ports.

The book is published by Brady (Prentice-Hall), is 363 + xv pages, and sells for $19.95. (We'll send you one for a little less, see page 3 of this newsletter)



Volume Catalog for Corvus and Sider........Bob Sander-Cederlof

When I have a stack of floppies, I can quickly shuffle through them reading labels to find the two or three most likely to have the elusive file I want. On a hard disk it is hard to read the labels....

The last time I had a Corvus sitting in this room, there was a program on the utility disk which would list the first file name from each volume. If you were careful about making the first file name descriptive, it could act like a label. Of course, nearly every floppy around here has a first file named HELLO. Not too helpful.

Several years ago Bill Morgan wrote a program we published in AAL called the Catalog Arranger. It allows you to re-arrange the filenames in any catalog to any order you wish, and to rename the files using any combination of upper/lower case, inverse, flashing, and control-characters. I use Catalog Arranger to make a "title" file at the beginning of each hard disk volume. (If you never heard of Catalog Arranger, you can type it in from AALs of October 1982 and January 1983. It is also available on a Quarterly disk for only $15.)

Now that I don't have the Corvus, or its handy program for listing the names of the first file in each volume, I decided to write my own. The program that follows prints out the volume number, two spaces, and then the name of the first file. If the volume is empty, it prints "<<<EMPTY VOLUME>>>". You can abort the listing by pressing RETURN or ESCAPE, or pause it by pressing any other key.

Lines 1090-1100 set the origin at $803 and cause the object program to be written on a BRUNnable file called CAT. We write it at $803 rather than $800 so that Applesoft will work correctly after CAT is finished. Applesoft gets upset if $800 has any non-zero value in it.

I used two monitor routines. $FD8E prints a carriage return, and $FDED prints any character from the A-register.

I also used routines inside DOS. $AFF7 reads the VTOC of the current volume, using the inverse volume number from the variable R.VOLUME. If there is any error in trying to read the VTOC, DOS would normally go through its procedure of printing the message and returning to Applesoft. We cannot allow that, so I install a temporary patch to make the error condition cause a return to my code with carry set. If there is no error, carry will be clear. The only likely error is that I am asking for the VTOC of a non-existing volume, which means I have already processed them all. The patching, call, and de-patching take place in lines 1160-1220. Line 1230 branches to my exit routine if there was an error reported.

I also call on $B011 to read the first sector of the catalog. If you call $B011 with carry clear it reads the first sector of the catalog; with carry set, it reads the next sector of the catalog. The sector is read into a standard buffer at

$B4BB-B5BA. See "Beneath Apple DOS" for a complete description of the catalog sectors.

Lines 1270-1440 convert the volume number to decimal and print it out. Lines 1450-1480 check for an empty directory. If it is empty, lines 1740-1800 print the empty volume message. Otherwise, lines 1490-1550 print the file name. Right here my program could use some improvement. It is possible for an empty volume to not look empty, because deleted files are not physically removed from the catalog. The byte we check for an empty volume could have $FF in it, signifying a deleted file. In this case my program should continue searching through the catalog for either the end or a non-deleted file. I didn't think it was absolutely necessary, since I was using Catalog Arranger to remove all deleted files from the catalog and position the title line at the very top.

Line 1730 returns back to DOS by JMP $3D0. This reminds me of glitch we all run into from time to time. If you intend to BRUN a program from the command level of the assembler or of Applesoft, it needs to end with JMP $3D0. Ending with an RTS will not do, because BRUN does not leave any return address on the stack. On the other hand, if you intend to start the program by using a CALL or MGO or $...G command, it is all right to end with an RTS. In fact, with a CALL from inside a running Applesoft program you MUST use an RTS. Just something to watch out for.

```
                  1000 *SAVE S.HARD CAT
                  1010 *------------------------------
03D9-             1020 RWTS       .EQ $03D9
03E3-             1030 GETIOB     .EQ $03E3
                  1040 *------------------------------
B4BB-             1050 CATALOG.BUFFER .EQ $B4BB
                  1060 *------------------------------
B5F9-             1070 R.VOLUME   .EQ $B5F9
                  1080 *------------------------------
                  1090        .OR $803
                  1100        .TF CAT
                  1110 *------------------------------
                  1120 HARD.CAT
0803- 20 8E FD    1130        JSR $FD8E
0806- A9 FE       1140        LDA #$FE     FOR VOLUME=1 TO 254
0808- 8D F9 B5    1150        STA R.VOLUME     (.EOR.FF OF VOLUME #)
                  1160 *---PATCH DOS TO TRAP ERROR------
080B- A9 60       1170 .1     LDA #$60     'RTS'
080D- 8D 9E B0    1180        STA $B09E
0810- 20 F7 AF    1190        JSR $AFF7    READ VTOC OF VOLUME
                  1200 *---REMOVE PATCH-----------------
0813- A9 B0       1210        LDA #$B0     'BCS'
0815- 8D 9E B0    1220        STA $B09E
0818- B0 5A       1230        BCS .7       OUT OF LOOP, BEYOD LAST VOLUME
                  1240 *---READ 1ST CATALOG SECTOR------
081A- 18          1250        CLC
081B- 20 11 B0    1260        JSR $B011
                  1270 *---PRINT VOLUME #---------------
081E- AD F9 B5    1280        LDA R.VOLUME        INVERSE OF #
0821- 49 FF       1290        EOR #$FF            BACK TO NORMAL FORM
0823- A2 B0       1300        LDX #"0"            CONVERT TO DECIMAL
0825- C9 0A       1310 .2     CMP #10             ANY 10'S?
0827- 90 05       1320        BCC .3              ...NONE LEFT
0829- E9 0A       1330        SBC #10             ...YES. DIMINISH
082B- E8          1340        INX                    AND COUNT IT
082C- D0 F7       1350        BNE .2              ...ALWAYS
082E- 48          1360 .3     PHA                 SAVE UNITS
082F- 8A          1370        TXA                 PRINT TENS
0830- 20 ED FD    1380        JSR $FDED
0833- 68          1390        PLA                 GET UNITS
0834- 09 B0       1400        ORA #"0"            AND PRINT IT
0836- 20 ED FD    1410        JSR $FDED
```

```
0839- A9 A0    1420        LDA #" "        PRINT "  "
083B- 20 ED FD 1430        JSR $FDED
083E- 20 ED FD 1440        JSR $FDED
               1450 *---PRINT NAME OF FIRST FILE-----
0841- A0 0B    1460        LDY #11
0843- B9 BB B4 1470        LDA $B4BB,Y
0846- F0 32    1480        BEQ .8          ...EMPTY VOLUME
0848- A2 00    1490        LDX #0
084A- B9 BE B4 1500 .4     LDA $B4BB+3,Y
084D- C8       1510        INY
084E- 20 ED FD 1520        JSR $FDED
0851- E8       1530        INX
0852- E0 1E    1540        CPX #30
0854- 90 F4    1550        BCC .4
               1560 *---PRINT CARRIAGE RETURN--------
0856- 20 8E FD 1570 .5     JSR $FD8E
               1580 *---NEXT VOLUME------------------
0859- CE F9 B5 1590        DEC R.VOLUME
               1600 *---POSSIBLE PAUSE OR ABORT------
085C- AD 00 C0 1610        LDA $C000       ANY KEY PAUSES
085F- 10 AA    1620        BPL .1          NO KEY
0861- 8D 10 C0 1630        STA $C010
0864- C9 8D    1640        CMP #$8D        <RETURN> ABORTS
0866- F0 0C    1650        BEQ .7
0868- AD 00 C0 1660 .6     LDA $C000       PAUSE LOOP
086B- 10 FB    1670        BPL .6
086D- 8D 10 C0 1680        STA $C010
0870- C9 8D    1690        CMP #$8D        AGAIN. RETURN AGORTS
0872- D0 97    1700        BNE .1
               1710 *--------------------------------
0874- 20 8E FD 1720 .7     JSR $FD8E       <RETURN>
0877- 4C D0 03 1730        JMP $3D0        BACK TO DOS
               1740 *---EMPTY VOLUME-----------------
087A- A2 00    1750 .8     LDX #0
087C- BD 87 08 1760 .9     LDA MT.X        PRINT STRING BELOW
087F- F0 D5    1770        BEQ .5
0881- 20 ED FD 1780        JSR $FDED
0884- E8       1790        INX
0885- D0 F5    1800        BNE .9          ...ALWAYS
               1810 *--------------------------------
0887- BC BC BC
088A- C5 CD D0
088D- D4 D9 A0
0890- D6 CF CC
0893- D5 CD C5
0896- BE BE BE 1820 MT     .AS -/<<<EMPTY VOLUME>>>/
0899- 00       1830        .HS 00
               1840 *--------------------------------
```

Shrinking Code Inside ProDOS..............Bob Sander-Cederlof

David Johnson challenged me a few days ago. We were talking about ProDOS: the need for a ProDOS version of the S-C Macro Assembler, the merits vs. enhanced DOS 3.3, and the rash of recent articles on shrinking various routines inside DOS to make room for more features.

I've been avoiding ProDOS as much as possible, trying not to notice its ever-increasing market-share. Dave's comment, "ProDOS is a fertile field for your shrinking talent," may have finally pushed me into action.

I am trying to make the ProDOS version of the S-C Macro Assembler, but is hard. I have Apple's manuals, Beneath Apple ProDOS, and the supplement to the latter book which explains almost every line of ProDOS code. Nevertheless, version 1.1.1 of ProDOS doesn't seem to conform to all these descriptions in every particular. I spent four hours last night chasing one little discrepancy. (Turned out to be my own bug, though.)

In the process, I ran across the subroutine ProDOS uses to convert binary numbers to decimal for printing. In version 1.1.1 it starts at $A62F, and with comments looks like this.

```
                    1000 *SAVE S.PRODOS NUMOUT
                    1010 *--------------------------------
                    1020        .OR $A62F
                    1030        .TA $800
                    1040 *--------------------------------
                    1050 *    CONVERT 00.XX.AA FROM BINARY TO DECIMAL
                    1060 *    STORE UNITS DIGIT AT $201,Y
                    1070 *    STORE OTHER DIGITS AT SUCCESSIVE LOWER ADDRESSES
                    1080 *
                    1090 *      Note:  it is assumed and required that
                    1100 *             ACCUM+2 already by zeroed!
                    1110 *             Either that, or already set to the
                    1120 *             highest byte of a 24-bit value.
                    1130 *--------------------------------
                    1140 CONVERT.TO.DECIMAL
A62F- 8E B0 BC      1150        STX ACCUM+1
A632- 8D AF BC      1160        STA ACCUM
A635- 20 4D A6      1170 .1     JSR DIVIDE.ACCUM.BY.TEN
A638- AD B2 BC      1180        LDA REMAINDER
A63B- 09 B0         1190        ORA #"0"
A63D- 99 01 02      1200        STA BUFFER+1,Y
A640- 88            1210        DEY
A641- AD AF BC      1220        LDA ACCUM     CHECK IF QUOTIENT ZERO
A644- 0D B0 BC      1230        ORA ACCUM+1
A647- 0D B1 BC      1240        ORA ACCUM+2
A64A- D0 E9         1250        BNE .1
A64C- 60            1260        RTS
                    1270 *--------------------------------
                    1280 DIVIDE.ACCUM.BY.TEN
A64D- A2 18         1290        LDX #24       24 BITS IN DIVIDEND
A64F- A9 00         1300        LDA #0        START WITH REM=0
A651- 8D B2 BC      1310        STA REMAINDER
A654- 20 D7 AA      1320 .1     JSR SHIFT.ACCUM.LEFT
A657- 2E B2 BC      1330        ROL REMAINDER
A65A- 38            1340        SEC           REDUCE REMAINDER MOD 10
A65B- AD B2 BC      1350        LDA REMAINDER
A65E- E9 0A         1360        SBC #10
A660- 90 06         1370        BCC .2        STILL < 10
A662- 8D B2 BC      1380        STA REMAINDER
A665- EE AF BC      1390        INC ACCUM     QUOTIENT BIT
A668- CA            1400 .2     DEX           NEXT BIT
A669- D0 E9         1410        BNE .1
A66B- 60            1420        RTS
                    1430 *--------------------------------
```

```
BCAF-             1440 ACCUM       .EQ $BCAF,BCB0,BCB1
BCB2-             1450 REMAINDER   .EQ $BCB2
0200-             1460 BUFFER      .EQ $0200
                  1470 *--------------------------------
                  1480        .OR $AAD7
                  1490        .TA $900
                  1500 *--------------------------------
                  1510 SHIFT.ACCUM.LEFT
AAD7- 0E AF BC    1520        ASL ACCUM
AADA- 2E B0 BC    1530        ROL ACCUM+1
AADD- 2E B1 BC    1540        ROL ACCUM+2
AAE0- 60          1550        RTS
```

The conversion routine is designed to handle values between 0 and $FFFFFF. The highest byte must already have been stored at ACCUM+2 before calling CONVERT.TO.DECIMAL. The middle byte must be in the X-register, and the low byte in the A-register. The decimal digits will be stored in ASCII in the $200 buffer, starting and $201+Y and working backwards.

One way of converting from binary to decimal is to perform a series of divide-by-ten operations. After each division, the remainder will be the next digit of the decimal value, working from right to left. That is the technique ProDOS uses, and the division is done by the subroutine in lines 1280-1420.

The dividend is in ACCUM, a 3-byte variable. The low byte is first, then the middle, and finally the high byte. One more byte is set aside for the remainder. A 24-step loop is set up to process all 24 bits of ACCUM. In the loop ACCUM and REMAINDER are shifted left. If REMAINDER is 10 or more, it is reduced by ten and the next quotient bit set to 1; otherwise the next quotient bit is 0.

The first possible improvement I noted was in the area of lines 1330-1360. the ROL REMAINDER will always leave carry status clear, because we never let REMAINDER get larger than 9. If we delete the SEC instruction, and change SBC #10 to SBC #9 (because carry clear means we need to borrow), we can save one byte. But that's not really worth the effort.

Next I realized that REMAINDER could be carried in the A-register within the 24-step loop, and not stored until the end of the loop. Here is that version, which saves seven bytes (original = 31 bytes, this one = 24 bytes):

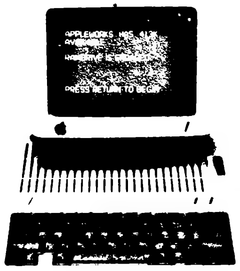
```
                  1260 DIVIDE.ACCUM.BY.TEN
081E- A2 18       1270        LDX #24       24 BITS IN DIVIDEND
0820- A9 00       1280        LDA #0        START WITH REM=0
0822- 20 3A 08    1290 .1     JSR SHIFT.ACCUM.LEFT
0825- 2A          1300        ROL
0826- C9 0A       1310        CMP #10
0828- 90 05       1320        BCC .2        STILL < 10
082A- E9 0A       1330        SBC #10
082C- EE 36 08    1340        INC ACCUM     QUOTIENT BIT
082F- CA          1350 .2     DEX           NEXT BIT
0830- D0 F0       1360        BNE .1
0832- 8D 39 08    1370        STA REMAINDER
0835- 60          1380        RTS
```

To make sure my version really worked, I re-assembled the conversion program with an origin of $800, and appended a little test program. Here is my test program, which converts the value at $0000...0002 and prints it out.

```
0844- A5 00     1510 T       LDA 0
0846- 8D 38 08  1520         STA ACCUM+2
0849- A6 01     1530         LDX 1
084B- A5 02     1540         LDA 2
084D- A0 0A     1550         LDY #10
084F- 20 00 08  1560         JSR CONVERT.TO.DECIMAL
0852- C8        1570 .1      INY
0853- B9 01 02  1580         LDA BUFFER+1,Y
0856- 20 ED FD  1590         JSR $FDED
0859- C0 0A     1600         CPY #10
085B- 90 F5     1610         BCC .1
085D- 60        1620         RTS
```

My best version is yet to come. I considered the fact that we could SHIFT the next quotient bit into the low end of ACCUM rather than using INC ACCUM to set a one-bit. I rearranged the loop so that the remainder reduction was done first, followed by the shift-left operation. I had to change the remainder reduction to work modulo 5 rather than 10, because the shifting operation came afterwards. I also had to include my own three lines of code to ROL ACCUM, since the little subroutine in ProDOS started with ASL ACCUM. The result is still shorter than 31 bytes, but only four bytes shorter. Nevertheless, it is faster and neater, in my opinion.

```
                1640 DIVIDE.ACCUM.BY.TEN.SHORTEST
085E- A2 18     1650         LDX #24       24 BITS IN DIVIDEND
0860- A9 00     1660         LDA #0        START WITH REM=0
0862- C9 05     1670 .1      CMP #5
0864- 90 02     1680         BCC .2        STILL < 10
0866- E9 05     1690         SBC #5
0868- 2E 36 08  1700 .2      ROL ACCUM
086B- 2E 37 08  1710         ROL ACCUM+1
086E- 2E 38 08  1720         ROL ACCUM+2
0871- 2A        1730         ROL
0872- CA        1740         DEX           NEXT BIT
0873- D0 ED     1750         BNE .1
0875- 8D 39 08  1760         STA REMAINDER
0878- 60        1770         RTS
```


PRESS RETURN TO BEGIN

Fast Text Windows for Applesoft..................Michael Ching

2118 Kula Street, Honolulu, HI 96817

The program WINDER by Mike Seeds in the January 1985 NIBBLE was found to be very interesting. This was especially so because we, coincidentally, had been working on a similar routine for use in an upcoming strategy sports game.

The main difference between our programs was that the routines used in WINDER are written completely in Applesoft, and thus suffer from the relatively slow speed of the Applesoft interpreter. This is especially evident in the opening of the windows. Our routine. on the other hand, is written in assembly language and executes more quickly.

There are a couple of other major differences. Seeds' routine saves the text, to be overwritten by the window, in a string array WS$. Our routine saves the text in the secondary text page (memory locations $800 through $BFF). One advantage of doing this is that more than one window can be opened at the same time (although the windows may not overlap). A disadvantage is that the secondary text page occupies the same space that an Applesoft program normally would start at. This makes it necessary to relocate the Applesoft program above the secondary text page.

Another difference is that WINDER specifies the window dimensions with the width and height of the window, along with the top and left coordinates. We chose to specify directly the top, bottom, left, and right boundaries.

The assembly language routine is called by the familiar & followed by the appropriate parameters. The format is & WT,WB,WL,WR,TP where WT is the top coordinate of the window, WB is the bottom coordinate, WL is the left coordinate, WR is the right coordinate, and TP is the text page number. If TP is set to 1, the text to be replaced by the window is saved to the secondary text page and the window is formed. If TP is set to 2, the text is restored to the primary text page from the secondary text page. At present, there is no error checking of the parameter values, and care must be taken to ensure that WB is set greater than WT, and WR greater than WL.

The program is assembled to load into the tail end of the input buffer and the free space in page 3 ($2F5-3C9). The portion inside page 2 is only used to set up the ampersand hook, so it is not a problem if this code gets wiped out by long input lines after loading. This setup is done in lines 1250-1290.

Lines 1320-1470 perform the task of getting the parameter values from Applesoft and placing them into temporary storage. The routines GETBYT and COMBYTE are used, and will evaluate expressions used in the calling Applesoft program. The width of the window is also calculated here. The text page value is decremented by one for ease of future manipulation, Line 1340 initializes the beginning of a loop which will copy the characters in the designated text page to the opposite text page.

Lines 1500-1510 call the monitor routine BASCALC. BASCALC calculates the starting (leftmost) memory address of the screenline, and stores it in the pointers BASL and BASH.

Lines 1520-1640 set up two pointers, one in the real screen and one in the alternate screen area. The pointers point to the beginning of the current line starting at the left edge of the caller's window. A1 points at the source, and A2 at the destination, for a move loop which will copy the characters within the window on the current line.

The destination address is the source address offset by $400 (up or down depending on the source text page). The calculation is done by exclusive ORing the source address with #$0C (or 00001100 in binary). For example, if BASH was $07, exclusive ORing will yield $0B. If it was $0B, exclusive ORing will yield $07.

Lines 1660-1700 comprise the move loop.

Lines 1720-1850 check to see if the frame of the window needs to be drawn. If the text page is being restored (window being closed), then the frame routine is skipped. If the window is being cleared, the frame is drawn.

First I store an inverse blank at each end of the line, which is sufficient for all except the top and bottom lines. Then I check: if it is the top or bottom line, I fill in the rest of the line with inverse blanks.

Lines 1870-1900 check whether the entire window has been processed. If not, the program loops back to process the next line.

Lines 1920-2050 check to see whether the window boundaries need to be set. If the window is being opened (TPAGE = 0), then they are set, and HOME clears out the window. Note that the window parameters are set so that the frame is outside it.

```
                    1000 *SAVE S.WINDOWS
                    1010 *--------------------------------
                    1020 * MOVE WINDOW
                    1030 * by Mike Ching, Kula Software
                    1040 *    2118 Kula Street. Honolulu, HI 96817
                    1050 *--------------------------------
20-                 1060 WNDLFT   .EQ $20
21-                 1070 WNDWDTH  .EQ $21
22-                 1080 WNDTOP   .EQ $22
23-                 1090 WNDBTM   .EQ $23
28-                 1100 BASL     .EQ $28
29-                 1110 BASH     .EQ $29
18-                 1120 A1       .EQ $18,19     MEMORY SOURCE START
1A-                 1130 A2       .EQ $1A,1B     MEMORY SOURCE END
                    1140 *--------------------------------
03F5-               1150 AMPERV   .EQ $3F5
                    1160 *--------------------------------
E6F8-               1170 GETBYT   .EQ $E6F8
E74C-               1180 COMBYTE  .EQ $E74C
FBC1-               1190 BASCALC  .EQ $FBC1
FC58-               1200 HOME     .EQ $FC58
```

```
                *--------------------------------
                        .OR $2F5
                        .TF B.WINDOWS
                *--------------------------------
02F5- A9 00     SETUP   LDA #MOVE.WINDOW     SET UP & VECTOR
02F7- 8D F6 03          STA AMPERV+1
02FA- A9 03             LDA /MOVE.WINDOW
02FC- 8D F7 03          STA AMPERV+2
02FF- 60                RTS
                *--------------------------------
                MOVE.WINDOW
0300- 20 F8 E6          JSR GETBYT   GET VALUES FROM APPLESOFT
0303- 8E 9F 03          STX TOP
0306- 8E A4 03          STX LINE
0309- 20 4C E7          JSR COMBYTE
030C- 8E A0 03          STX BOTTOM
030F- 20 4C E7          JSR COMBYTE
0312- 8E A1 03          STX LEFT
0315- 20 4C E7          JSR COMBYTE
0318- 8E A2 03          STX RIGHT
031B- 38                SEC          WIDTH = RIGHT-LEFT
031C- 8A                TXA
031D- ED A1 03          SBC LEFT
0320- 8D A3 03          STA WIDTH
0323- 20 4C E7          JSR COMBYTE  GET DIRECTION (1 OR 2)
0326- CA                DEX
0327- 8E A5 03          STX TPAGE
                *--------------------------------
                MOVE.LINE
032A- AD A4 03          LDA LINE     BASL,H = BASCALC(LINE)
032D- 20 C1 FB          JSR BASCALC
0330- 18                CLC
0331- A5 29             LDA BASH
0333- AE A5 03          LDX TPAGE
0336- F0 02             BEQ .1       ...SOURCE IS REAL SCREEN
0338- 49 0C             EOR #$0C     ...SOURCE IS SAVED SCREEN
033A- 85 19     .1      STA A1+1     SOURCE HI BYTE
033C- 49 0C             EOR #$0C     FLIP TEXT PAGE
033E- 85 1B             STA A2+1     DESTINATION HI BYTE
0340- 18                CLC          MEMSTART = BASL,H + LEFT
0341- A5 28             LDA BASL
0343- 6D A1 03          ADC LEFT
0346- 85 18             STA A1       SOURCE LO BYTE
0348- 85 1A             STA A2       DESTINATION LO BYTE
                *---MOVE THE LINE SEGMENT--------
034A- AC A3 03          LDY WIDTH
034D- B1 18     .2      LDA (A1),Y
034F- 91 1A             STA (A2),Y
0351- 88                DEY
0352- 10 F9             BPL .2
                *---IF CLEARING, DRAW FRAME------
0354- AC A5 03          LDY TPAGE
0357- D0 1B             BNE .4       ...NOT CLEAR. DO NOT DRAW FRAME
0359- A9 20             LDA #$20     INVERSE BLANK
035B- 91 18             STA (A1).Y   LEFT SIDE
035D- AC A3 03          LDY WIDTH
0360- 91 18             STA (A1).Y   RIGHT SIDE
0362- AE A4 03          LDX LINE
0365- EC 9F 03          CPX TOP
0368- F0 05             BEQ .3       ...TOP LINE
036A- EC A0 03          CPX BOTTOM
036D- D0 05             BNE .4       ...NEITHER TOP NOR BOTTOM
036F- 91 18     .3      STA (A1).Y
0371- 88                DEY
0372- D0 FB             BNE .3
                *---NEXT LINE-------------------
0374- EE A4 03  .4      INC LINE     UNTIL LINE > BOTTOM
0377- AD A0 03          LDA BOTTOM
037A- CD A4 03          CMP LINE
037D- B0 AB             BCS MOVE.LINE     ANOTHER LINE TO MOVE
                *---IF CLEARING, SET WINDOW------
037F- AD A5 03          LDA TPAGE
0382- D0 1A             BNE .5
0384- AE A1 03          LDX LEFT
0387- E8                INX
0388- 86 20             STX WNDLFT
```

```
038A- AE A3 03 1970        LDX WIDTH
038D- CA       1980        DEX
038E- 86 21    1990        STX WNDWDTH
0390- AE 9F 03 2000        LDX TOP
0393- E8       2010        INX
0394- 86 22    2020        STX WNDTOP
0396- AE A0 03 2030        LDX BOTTOM
0399- 86 23    2040        STX WNDBTM
039B- 20 58 FC 2050        JSR HOME
039E- 60       2060 .5     RTS
               2070 *--------------------------------
039F-          2080 TOP    .BS 1        PROGRAM STORAGE
03A0-          2090 BOTTOM .BS 1
03A1-          2100 LEFT   .BS 1
03A2-          2110 RIGHT  .BS 1
03A3-          2120 WIDTH  .BS 1
03A4-          2130 LINE   .BS 1
03A5-          2140 TPAGE  .BS 1
               2150 *--------------------------------
```

The next listing shows the revised WINDER routine using the assembly language routines. Line 40 checks to see if the program has been relocated above the secondary text page. If not, the start of program pointers are changed and the program is re-RUN. This causes DOS to position the program above the secondary text page. Line 50 BRUNS the assembly language routine.

The program is really quite different from that of Mike Seeds, as you can see if you compare them. Clearing and restoring windows is now very efficient, due to the &-routine. I moved the delay and closing logic into a common subroutine. I also added a randomly sized and positioned window in lines 400-410.

```
10  REM  WINDOW DEMO PROGRAM, BASED ON PROGRAM
20  REM  BY MIKE SEEDS  NIBBLE. JAN 1985
30  REM  ----------------------
40 P = 12: IF  PEEK (104) < P THEN  POKE 104,P: POKE P * 256.0: PRINT  CHR$
     (4)"RUN WINDOW DEMO"
50  PRINT  CHR$ (4)"BRUN B.WINDOWS"
60  REM  ----------------------
100  TEXT : HOME
110  FOR I = 1024 TO 2047 STEP 128: FOR J = 0 TO 119: POKE I + J, RND (1)
      * 26 + 193: NEXT J,I
120  PRINT "          WINDOW DEMONSTRATION";: CALL  - 868: PRINT : CALL  -
     868
130  VTAB 22: CALL  - 958: PRINT : PRINT "     PRESS ANY KEY TO HALT";
140  REM  ------------------------
150 T = 10:B = 14:L = 12:R = 21: & T.B,L,R,1: REM  OPEN WINDOW
160  PRINT " TINY   WINDOW": GOSUB 1000: REM   DELAY AND CLOSE WINDOW
170  REM ----------------------
200 T = 2:B = 7:L = 6:R = 31: & T.B,L,R,1
210  VTAB T + 3: HTAB 4: PRINT "NOTICE THE TEXT IS": HTAB 4: PRINT "RESTO
     RED CORRECTLY."
220  GOSUB 1000
230  REM --------------------
260 T = 10:B = 19: & T.B,L,R.1
270  FOR J = 1 TO 25: PRINT "  ";J,J * J: NEXT J
280  PRINT : PRINT " SCROLLING IS AUTOMATIC"
290  GOSUB 1000
330  REM -------------------------
400 W =  RND (1) * 20 + 5:H =  RND (1) * 10 + 5:T =  RND (1) * (24 - H):B
     = T + H:L =  RND (1) * (40 - W):R = L + W
410  & T,B,L,R,1: PRINT "ABCDEFGHIJKLMNOPQRSTUVWXYZ": GOSUB 1000
420  GOTO 150
1000  FOR D = 1 TO 1500: NEXT
1010  & T,B,L,R,2: REM CLOSE WINDOW
1020  IF  PEEK ( - 16384) < 128 THEN  RETURN
1030  POP : POKE  - 16368,0: TEXT : HOME : END
```

An 8086/8088 Cross Assembler.....................Don Rindsberg

As one of S-C's avid fans, I have developed an 8086/8088 Cross Assembler for your Apple which will enable you to generate code to run on the IBM PC's and their clones as well as many other 16-bit machines. All the 8086/8088 instructions are covered as well as the multiplicity of addressing modes. The mnemonics are based on Microsoft's assembler. This assembler is based on S-C Assembler II Version 4.0 (the one before Macro Assembler), so it doesn't include the newer features like macros or the EDIT command. Documentation covering the differences from the 6502 version is included.

With Bob's permission, XSM 8086/8088 is available to owners of the S-C 6502 assembler (Version 4.0 or later) for $80.00 postpaid. Included on the disk are sample source programs so you can become familiar with the syntax. Send personal check or money order (no credit cards or purchase orders) to:

The Bit Stop
5958 S. Shenandoah Rd.
Mobile, AL 36608
Attn: Don Rindsberg
(205) 342-1653

A Powerful 65816 Board on the Horizon......Bob Sander-Cederlof

Some of you may have heard of Micro Magic, a company in Maryland that is planning to produce a plug-in card for your Apple with fast RAM and a fast 65816. Well, if not, now you have.

I spoke yesterday with Will Troxell, and got an overview of their plans. He and Frank Krol are working together on the project. Their goal is to produce the most powerful and flexible card they can and yet still bring it in for a low price. The card will basically be similar to the Accelerator //e, in that it consists of a fast microprocessor, fast RAM, and the logic to take control away from the 6502 or 65C02 on your Apple motherboard.

But instead of a 65C02 running at 3.58 MHz, you will get a 65816 running at 6 MHz. Instead of one row of RAM chips, you get two. Troxell's board will probably come with 64K or 128K of 6MHz dynamic RAM, but later this year they have been promised that 256K RAMs fast enough for 6 MHz operation will be in production; then you will be able to expand your board to 256K or 512K bytes of RAM.

There is a firmware socket on the board which can accept a 27128 (16K bytes of firmware, the same as you find in a //c). They do not plan to include any firmware at the beginning, but it certainly can be filled up with your own goodies.

There are two external connectors on the board. One of these allows you to add another 512K RAM. Remember, this is directly addressable RAM, not bank-switched. The 65816 can directly address up to 16 megabytes, with its 24-bit address bus.

It is also exciting to remember that a plain ol 6502 running at 1 MHz (what you have now) is roughly equivalent in speed to most of the 8088 and Z-80 computers on the market. A 6 MHz 6502 could beat a 20MHz Z-80 (were they to make one so fast). A 6 MHz 65816 will beat out 68000's, 80286's, and so on. Why is this true? Because all those other chips use microprogrammed instruction sets, taking many clock cycles for each instruction. The 6502 and its progeny are fully implemented in hardware gates, so only a handful of clock cycles are needed.

Furthermore, a 65816 instruction will take from one to four bytes of memory, while a 68000 instruction will take 2, 4, 6, 8, or 10 bytes. Now I am not trying to deny the power of some of those 68000 instructions. One of them may take many steps in 65816 code. Especially if you need to deal with 32-bit operands. But it is my experience that those super instructions are relatively infrequent in practical programs. Most programs spend most of their time just moving bytes from here to there and back again.

Now if we could only get one! For about fifteen months we have been hearing "in two to four weeks". We could despair, were it not for our historical perspective. The same thing happened with the 65C02, and now we really do have them in abundance. By this time next year, you may be hearing solid confirmation of the rumor (heard this week) that Apple and GTE are discussing large orders of 65816s.

But I digress. Back to Troxell and Krol. There new board will be called the MAX-816, and a new operating system they are designing for it will be MAX-OS. A special circuit on the card will optimize memory re-mapping for both DOS and ProDOS, automatically, so that maximum possible use is made of the fast RAM on the card. THe fewer times the card has to slow down to use motherboard RAM, the faster your programs fly.

MAX-OS will not be necessary for you to get a bang out of MAX-816, because it will work like the Accelerator //e and make most existing programs six times faster (exclusive of I/O). But when it is ready, it will open up new vistas, with RAM stretching out in every direction as far as the eye can see. In a design reminiscent of one from a certain large phone company, the kernel is written in assembly language, with a C-shell wrapped around it.

Personally, I am no great fan of complex operating systems. The simpler and smaller the better, in my book. I still like DOS 3.3, especially with enhancements I regularly patch in. Nevertheless it does take more management when you have the magnitude and variety of resources that will be in the Apple of the future. Maybe MAX-OS will be the winner.

If Will and Frank are whetting your appetite, you can write to them at Micro Magic, Box 281, Millersville, MD 21108. Or you might be able to reach them at (301) 987-6083.

USR Command to List Major Labels Only......Bob Sander-Cederlof

Sometimes when I am working with a large source file in the S-C Macro Assembler it would be nice to be able to list only those lines that define major labels. Seeing only them would give an overview of an entire file, and enable me to quickly find the section I want to work on.

A major label is one that starts with a letter. Local labels start with a period, macro private labels start with a colon. Lines might also start with an asterisk or semicolon, if they are comments, or with blank.

You can add commands to the Macro Assembler in several ways. One easy built in one is the USR command. A vector at $D007 (or $1007 with the low memory version) can point to the code to process a command of your own making. Lines 1080-1140 in the following listing set up the vector for my special USR command. Since it is in the high RAM area (sometimes called "language card"), I reference $C083 twice to write enable the RAM.

Once the USR vector is loaded, typing a command "USR" will execute my code. When this happens, the entire command I typed will be in a buffer starting at $200. Some routines exist inside S-C Macro which can help in parsing the command further and in implementing its functions, and I will use them in this example. If you have the source code to one of the S-C Macro versions, it is not too difficult to find these routines. And if you don't have it, you can always disassemble and analyze, a true form of adventure. The addresses shown in lines 1040-1060 correspond to version 2.0 of the S-C Macro Assembler.

Line 1165 calls on a subroutine I call PARSE.LINE.RANGE (PLR). PLR starts by setting up SRCP to point to the beginning of the source program, and ENDP to the end of same. Then it looks at the command line for various forms of line numbers. You might have none at all, in which case PLR is finished. You might have one number alone, or a period. (A period is shorthand for the last remembered line number.) That might be preceded by or followed by a comma. You might have two numbers separated by a comma. Here is a table showing what happens in each case:

	SRCP	ENDP	CARRY
none	pstart	pend	set
#	#start	#end	clear
#,	#start	pend	clear
,#	pstart	#end	clear
#1,#2	#1start	#2end	clear

where # means number or "."
pstart = address of start of source code
pend = address of end of source code
#start = address of starting line #
#end = address of ending line #

Line 1170 call a routine in the assembler to compare SRCP and ENDP to see if we are finished or not. The code is simply:

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- * SC.XREF - Generates a GLOBAL LABEL Cross Reference Table for complete documentation of source listings.
- * SC.GSR - Global Search & Replace eliminates teadious manual renaming of labels. Search all/part of source.
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Plugs into any slot to convert a 'dumb' centronics-type printer I/F card into a 'smart' one. Command menu eliminates need to remember complicated ESC codes. Features include perforation skip, auto page numbering with date & title. Includes large HIRES graphics & text screen dumps. Specify printer: MX-80 with Graftrax-80, MX-100, MX-80/100 with Graftraxplus, NEC 8092A, C.Itoh 8510 (Prowriter), OkiData 82A/83A with Okigraph & OkiData 92/93. SOURCE CODE: $30.00

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Plugs into any Apple slot. Holds one user-supplied 2Kx8 memory chip (6116 type RAM for program development or 2716 EPROM to keep your favorite routines on-line). Maps into $Cn00-CnFF and $C800-CFFF.

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Connect standard parallel printers to an Apple //c. C-PRINT is a hardware accessary that plugs into the standard Apple //c printer serial port. The other end plugs into any printer having a standard 36 pin centronics-type parallel connector. Just plug in and print! High speed data transfer at 9600 Baud. No need to reconfigure serial port or load software drivers for text printing.

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RAK-WARE 41 Ralph Road W. Orange N J 07052 (201) 325-1885

```
       LDA SRCP
       CMP ENDP
       LDA SRCP+1
       SBC ENDP+1
```

Lines 1200-1210 pick up the first character after the line number. The source line format in memory is one byte for a byte count, two bytes for the line number, the text of the line, and a final terminating 00 byte. The blank which follows just after the line number in listings is not actually stored.

Characters in a source line are stored in "low" ASCII, values between $01 and $7F. Values from $81 through $BF indicate 1 to 63 blanks. The value $C0 indicates repetitions of some other character. The byte following a $C0 is the repetition count, and the byte after that is the character to be repeated. Lines 1220-1240 check for blanks and repeat tokens. Lines 1340-1350 pick up the repeated character if we found a repeat token.

Lines 1360-1390 check if the first character is a letter. If not, this line will not be listed. Lines 1250-1320 are executed to skip over the current line without listing it. Since the first byte of the line has a byte count, it is added to SRCP to move up the next line.

At line 1400 I call LIST CURRENT LINE to ... you guessed it. This subroutine also advances SRCP, so after it is finished I jump back to the top to check pointers and get the next line.

After assembling the program, I type MGO INIT to hook it in. Then "USR 1070," would list just lines 1080 and 1160.

```
                  1000 *SAVE S.LIST MAJOR LABELS
                  1010 *---------------------------------
DD-               1020 SRCP   .EQ $DD,DE
                  1030 *---------------------------------
DEAF-             1040 PARSE.LINE.RANGE    .EQ $DEAF OR 1EAF
DF11-             1050 CMP.SRCP.ENDP       .EQ $DF11 OR 1F11
D737-             1060 LIST.CURRENT.LINE   .EQ $D737 OR 1737
                  1070 *---LINK COMMAND-----------------
0800- AD 83 C0    1080 INIT   LDA $C083    ENABLE LANGUAGE CARD
0803- AD 83 C0    1090        LDA $C083
0806- A9 11       1100        LDA #USR.LIST    SET UP USR VECTOR
0808- 8D 07 D0    1110        STA $D007
080B- A9 08       1120        LDA /USR.LIST
080D- 8D 08 D0    1130        STA $D008
0810- 60          1140        RTS
                  1150 *---USR COMES HERE---------------
                  1160 USR.LIST
0811- 20 AF DE    1165        JSR PARSE.LINE.RANGE
0814- 20 11 DF    1170 .1     JSR CMP.SRCP.ENDP
0817- 90 01       1180        BCC .2
0819- 60          1190        RTS
081A- A0 03       1200 .2     LDY #3       POINT TO FIRST CHAR
081C- B1 DD       1210        LDA (SRCP),Y
081E- 10 17       1220        BPL .5       NOT TOKEN
0820- C9 C0       1230        CMP #$C0
0822- B0 0F       1240        BCS .4       REPEAT TOKEN
0824- A0 00       1250 .3     LDY #0       SKIP TO NEXT LINE
0826- B1 DD       1260        LDA (SRCP),Y LINE LENGTH
0828- 18          1270        CLC
0829- 65 DD       1280        ADC SRCP
082B- 85 DD       1290        STA SRCP
082D- 90 E5       1300        BCC .1
082F- E6 DE       1310        INC SRCP+1
0831- D0 E1       1320        BNE .1       ...ALWAYS
                  1330 *---------------------------------
```

```
0833- A0 05    1340 .4      LDY #5        POINT AT RPTD CHAR
0835- B1 DD    1350         LDA (SRCP),Y
0837- C9 41    1360 .5      CMP #'A'
0839- 90 E9    1370         BCC .3        NOT LETTER
083B- C9 5B    1380         CMP #'Z'+1
083D- B0 E5    1390         BCS .3        NOT LETTER
083F- 20 37 D7 1400         JSR LIST.CURRENT.LINE
0842- 4C 14 08 1410         JMP .1
               1420 *--------------------------------
```

Review of the FCP Hard Disk................Bob Sander-Cederlof

First Class Peripherals has been advertising for some months now their 10 megabyte hard disk system (The Sider) for the Apple. At only $695, including drive, controller, cable, and software, it sounds too good to be true. We called them and asked for a chance to write a review, and they loaned us one for a month.

I first tried hooking it up to an Apple II Plus, the same one we have used with hard disks in the past. However, after 5 or 6 wasted hours, it still would not function. We could not even get the disk to completely initialize. I finally called the 800 number for customer service, and found out that there have been problems hooking the Sider to some II+'s. They suggested trying it on a //e before giving up. Sure enough, it worked perfectly on our //e. The Sider is sold subject to a 15-day trial period, so there is plenty of time to find out if it will work with your II+.

I am very pleased. The Sider works well, looks good, and is not too noisy. We have heard of at least one customer who did complain of the noise level, but I have never listened to a quieter one. Because of the venting design there is no internal fan, so the only noise is the spinning disk. Anyway, my office already has two fans going on Apples and another in a Minolta copier. The Sider nicely masks them all.

The size and shape are nice, too. It is somewhat smaller than I expected: less than 4x8x16 inches. At first I set it along side of my Apple (after all it is called the Sider), but now it is along the back edge of my work table. This way it takes practically no space at all, yet I can still easily reach the on/off switch.

The installation software that comes with the Sider initializes the 10 megabytes into four separate partitions. One is for DOS, one for ProDOS, one for CP/M, and one for Pascal. You can vary the partition size for each one, although a certain minimum amount must be allocated; you cannot squeeze one all the way out. The DOS partition allows a combination of floppy size volumes and large volumes. The large volumes give you three times the amount of a regular Apple floppy. I set mine up with 32 small volumes and one large volume.

The ProDOS partition divides the allocated space into two equal size volumes, designated /HARD1/ and /HARD2/. Since I shrank CP/M and Pascal to the minimum, the ProDOS volumes are about 2.5 megabytes each.

If you want to change the partitions, you have to completely re-initialize. That means all your files will disappear. Of course you can restore them from your backup floppy copies.

The only modification to DOS 3.3 that the Sider makes is to put a call to their firmware at $BD00. I decided to apply my own set of patches, which among other things speed up LOAD, BLOAD, RUN, and BRUN. They were not only compatible, they even speeded up the hard disk! Here is a table comparing the Sider with floppies, both with and without my patches:

BLOAD	----floppies-----		----The Sider----	
# sectors	standard	patched	standard	patched
22	7.7	3.8	3.0	1.3
69	18.7	5.6	6.7	2.4
131	32.6	8.6	12.3	3.8

I also timed the assembly of a large program, whose source was on two disks (the S-C Macro Assembler itself, in fact). With my speed up patches the floppy assembly took 4 minutes 50 seconds; the Sider with standard DOS took 3 minutes 50 seconds; the Sider with my patches took only 2 minutes 32 seconds.

All these times are under DOS 3.3 of course. ProDOS is about the same as my patched version of DOS in speed, but has other advantages like larger volumes and files.

The main competition for the Sider comes from the two most popular companies, Apple and Corvus. Apple's ProFILE hard disk is sleek and nice, and only costs three times what the Sider does. Since you are paying more, you also get less: Apple only supports ProDOS. The ProFILE doesn't work with CP/M, Pascal, or DOS 3.3. (Unless there is a new ProDOS compatible Pascal.) Corvus costs even more than ProFILE, last time I checked. On the other hand, they have an excellent reputation.

Its always hard to trust some new little company, even when they have a great product and price. Just who is First Class Peripherals, anyway? Well, they are a subsidiary of Xebec, one of the bigger makers of hard disks. Xebec has been around a long time (over ten years) and has a first class reputation. I think we can depend on them. The Sider comes with a one-year limited warranty, which I think means that if it breaks you send it in and they will fix it or replace it. (Note: a whole year, not just 90 days!) After the warranty has expired there is a flat $150 charge for repairs.

The only way to buy a Sider is directly from First Class Peripherals. You can call them at 1-800-538-1307, or write to 2158 Avenue C, Bethlehem, PA 18001. If you are in a user group of significant size, I understand someone at FCP might want to visit with a demo unit. You might give them a call.

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